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A New Middle Eocene Potamidid Gastropod from Brackish-Marine Deposits, Southern California

by

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Abstract. The potamidid gastropod *Potamides* (*Potamidopsis*) ***californica*** sp. nov. is described from brackish-marine deposits in the middle Eocene Matilija Sandstone north of Reyes Peak and at Matilija Hot Springs, Ventura County, southern California. This is the first record of the subgenus *Potamidopsis* in North America. Previously, it was known from uppermost Paleocene and middle Eocene deposits of France.

INTRODUCTION

The potamidid gastropod *Potamides* (*Potamidopsis*) previously has been known only from uppermost Paleocene and middle Eocene deposits in France (GLIBERT, 1962: 161–162). This brackish-marine gastropod has now been found in two areas within the middle Eocene Matilija Sandstone in Ventura County, southern California, and is here described as *Potamides* (*Potamidopsis*) ***californica*** sp. nov. The early through middle Eocene was a time of influx of many Old World mollusks and other invertebrates into the Pacific coast region of North America by way of Central America (SQUIRES, 1984, 1987), and *Potamidopsis* can now be added to this growing list of taxa.

Abbreviations used for catalog and/or locality numbers are: CSUN, California State University, Northridge; LACMIP, Los Angeles County Museum of Natural History, Invertebrate Paleontology Section; SDSNH, San Diego Society of Natural History; UCLA, University of California, Los Angeles (collections now housed at the LACMIP).

MATERIALS AND METHODS

The type locality of the new species is locality LACMIP 7226 in the Beartrap Creek area, Ventura County, southern California (Figure 1). Approximately 25 specimens were collected from this locality in the 1930s by paleontologists associated with the California Institute of Technology. These specimens, which are now housed at the LACMIP, are the best preserved material of the new species, and the primary type material used in this report was selected from them. Most of the specimens of the new species from the type locality are poorly preserved.

Approximately 60 specimens of the new species were collected also from the Beartrap Creek locality by JESTES (1963), who referred to the locality as UCLA 4254. These specimens are now stored at the LACMIP. I visited the locality in late 1990 and found a few specimens of the new species in float. The source bed of the float, however, could not be found because recent landslides had covered the outcrops.

This new species is also found near Matilija Hot Springs (Figure 1). Most specimens were collected from nearly vertical exposures along a roadcut. JESTES (1963) did some collecting from two localities (LACMIP 24258 and 24259) in these deposits and the specimens are now housed at the LACMIP. I have been recollecting from Jestes' two localities since 1980 and have recently found an additional locality (CSUN 1444) in the same area and another locality (CSUN 1450) along strike of the same beds a short distance to the north (Figure 1). No other outcrops of the beds were found. Abundant specimens of *Potamides* (*Potamidopsis*) ***californica*** were found at localities CSUN 1444, CSUN 1450, and LACMIP 24258, but only a few specimens were found at locality LACMIP 24259. All of the specimens of the new species at the Matilija Hot Springs area are obscured due to coating by well indurated siltstone.

STRATIGRAPHIC OCCURRENCES AND DEPOSITIONAL ENVIRONMENTS

In the vicinity of the Beartrap Creek locality is a section of several hundred meters of fine- to coarse-grained micaceous sandstone with local conglomerate (JESTES, 1963) that was mapped as part of the Matilija Sandstone by

VEDDER *et al.* (1973) and GIVENS (1974). On the basis of mollusks, GIVENS (1974) correlated the Matilija Sandstone in this area to the "Tejon Stage." SAUL (1983) and SQUIRES (1988) regarded the "Tejon Stage" as mostly middle Eocene in age with a small part assigned to the late Eocene.

At the Beartrap Creek locality, JESTES (1963) reported that the fossils were in a 60-cm-thick bed of coarse-grained calcareous sandstone. In addition to scattered pebbles, he found mudrock chips and some wood fragments. Some shell fragments are present, and some of the gastropod shells showed preferred orientation. Float from the now-covered outcrops reveals that the bed also contains very poorly sorted conglomeratic sandstone with single valves of bivalves and large fragments of oysters up to 10 cm in length. Fossils show evidence of transport, but the distance of transport was not great because indications of significant abrasion are absent.

JESTES (1963) interpreted the environment of deposition at the Beartrap Creek locality to be a mixture of brackish and nearshore marine on the basis of the types of mollusks. In addition to a few specimens of the freshwater bivalve *Unio*(?) *torreyensis* (Hanna, 1927), he found many specimens of the three brackish-marine mollusks: the bivalve *Cuneocorbula torreyensis* Hanna, 1927, and gastropods *Loxotrema turritum* Gabb, 1868, and *Nerita* (*Theliostyla*) *triangulata* Gabb, 1869. All of these mollusks have been found in middle Eocene brackish-marine deposits elsewhere on the Pacific coast of North America (VOKES, 1939; GIVENS, 1974; GIVENS & KENNEDY, 1976; SQUIRES, 1987). JESTES (1963) also reported the presence of *Potamides* sp., herein assigned to *Potamides* (*Potamidopsis*) ***californica***. Modern potamidid gastropods are confined to brackish-marine estuaries (KEEN, 1971).

The other mollusks found at the Beartrap Creek locality by JESTES (1963) are nearshore-marine mollusks. Examples include the bivalves *Acutostrea* cf. *A. idriaensis* Gabb, 1869, *Lucina* sp., *Crassatella* sp., and *Tivela* sp., and the gastropods *Turritella uvasana* Conrad, 1855, and *T. merriami*? Dickerson, 1913. All of these mollusks have been found in Eocene nearshore-marine or shelfal deposits elsewhere on the Pacific coast of North America (VOKES, 1939; GIVENS, 1974; SQUIRES, 1987, 1989).

The mixed assemblage at the Beartrap Creek locality must have been the result of storms that admixed brackish-marine and nearshore-marine species.

At the Matilija Hot Springs area, where the type section of the Matilija Sandstone is located, there is a 40-m-thick section of evaporites, red beds, limestone, lignite?, mudcracks, and interbedded shell accumulations (LINK, 1975; LINK & WELTON, 1982). These workers, as well as DIBBLEE (1987), mapped the section as the Matilija Sandstone. Based on the presence of planktonic foraminifers and coccoliths in the overlying Cozy Dell Formation, LINK & WELTON (1982) assigned the Matilija Sandstone to the middle Eocene P11 and P12 Zones.

The four localities from which specimens were collected in the Matilija Hot Springs area are similar in that each

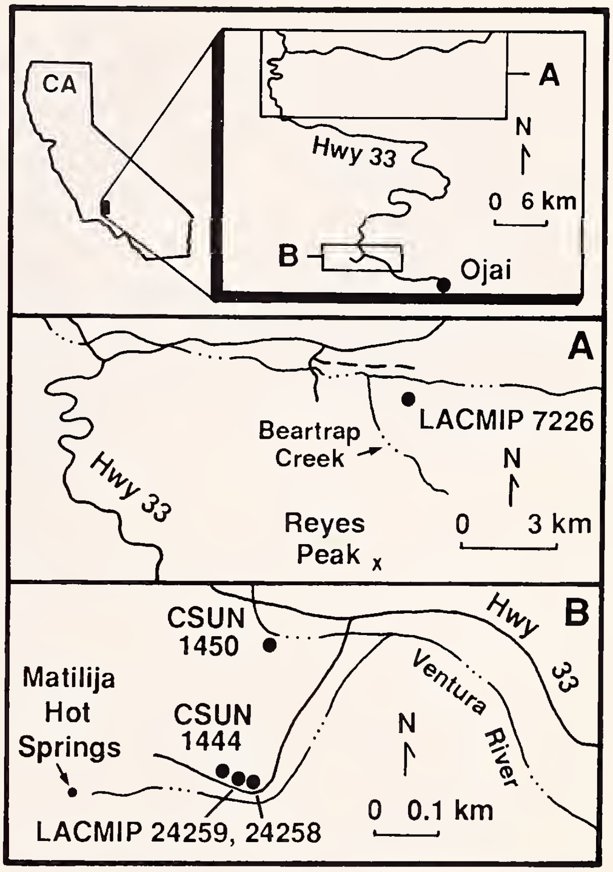


Figure 1

Geographic occurrences of *Potamides* (*Potamidopsis*) ***californica*** Squires, sp. nov., in southern California. A. Beartrap Creek area. B. Matilija Hot Springs area.

one is associated with 10-cm-thick siltstone or sandy siltstone beds surrounded by fine to very fine, well sorted and cross-bedded sandstone with scattered ostreid fragments. Specimens of all the mollusks at the four localities seem to be unabraded and show growth series. JESTES (1963) said the mollusks may be dwarfed, but normal-sized specimens of each taxon can be found. Many of the infaunal bivalves are articulated. The bivalve *Cuneocorbula torreyensis* forms coquinoids of unbroken single valves, as well as some articulated valves, at localities LACMIP 24258 and 24259. Some sort of concentration of the *Cuneocorbula torreyensis* shells must have taken place by means of waves or currents, but the distance of transport was short. At the other two localities, the distance of transport seems to be minimal.

JESTES (1963) interpreted the environment of deposition at the Matilija Hot Springs localities to be brackish marine on the basis of the types of mollusks. He found nearly all of the same brackish-marine species that he found at the Beartrap Creek locality. Jestes' findings of the following brackish-marine taxa are corroborated in this present work: the bivalves *Cuneocorbula torreyensis* and *Corbicula* sp., and the gastropod *Loxotrema turritum*. His *Ostrea* sp. is *Acutostrea idriaensis fettkei*? (Weaver, 1912). He also found an articulated specimen of a bivalve he identified as *Unio*?. Although it is an unionid and indicative of freshwater conditions, it is too poorly preserved to be assigned to any genus (C. Coney, personal communication). JESTES (1963) also reported the presence of *Potamides* aff. *P. tricarinata* (Lamarck, 1804), herein assigned to *Potamides* (*Potamidopsis*) ***californica***. The faunas at each of the four localities are generally similar, but the numbers of individuals of different species vary greatly. The only species that is present in the upper half but not in the lower half of the 35-m-thick section is *Cuneocorbula torreyensis*.

LINK (1975) and LINK & WELTON (1982) used the preliminary studies of JESTES (1963) as the basis for their faunal analysis at the Matilija Hot Springs area. On the basis of a sedimentological study, and supported by JESTES' (1963) findings of brackish-marine mollusks, LINK (1975) and LINK & WELTON (1982) determined that most of the Matilija Sandstone in the vicinity of Matilija Hot Springs is a deep-sea fan sequence but that the upper part is a shallow-marine sequence representing a coastal (paralic) environment. These paralic deposits are the ones that yield *Potamides* (*Potamidopsis*) ***californica***. LINK & WELTON (1982) interpreted the siltstone in these deposits as being associated with lagoons and the sandstones as being associated with beach-bar-channel complexes.

SYSTEMATIC PALEONTOLOGY

Family POTAMIDIDAE H. & A. Adams, 1854

Subfamily POTAMIDINAE H. & A. Adams, 1854

Genus *Potamides* Brongniart, 1810

Type species: By monotypy, *Potamides lamarcki* Brongniart, 1810.

Subgenus *Potamidopsis* Munier-Chalmas, 1900

Type species: By original designation?, *Cerithium tricarinatus* Lamarck, 1804.

Potamides (*Potamidopsis*) ***californica***
Squires, sp. nov.

(Figures 2–5)

Diagnosis: A *Potamidopsis* whose whorls have reticulate sculpture consisting of three equal-strength spiral ribs crossed by numerous axial ribs.

Description: Medium sized, turritelliform, with at least 10 concave-sided whorls, slightly coeloconoid. Protoconch unknown. Suture obscured by overhanging spiral sutural rib. Whorls strongly angulated near anterior suture by a carina, gently sloping above with three equal-spaced and approximately equal-strength spiral ribs. Interspaces with or without a single spiral thread. Whorls crossed by numerous opisthocline axial ribs of nearly same strength as spiral ribs. Nodes at intersections of spiral and axial ribs produce a reticulate sculpture pattern. Posteriormost spiral rib nodes usually slightly stronger than on the other two spiral ribs. Sutural spiral rib immediately posterior to sutúre and with or without nodes. Carina with prominent nodes where axial ribs intersect. Area anterior to carina on body whorl with two sharp and unnoded spiral ribs, the posterior one strongest. Area anterior to these two spiral ribs (*i.e.*, base of body whorl) with four to five weaker and unnoded spiral ribs. Columella short. Aperture missing.

Holotype: LACMIP 11300.

Type locality: Locality LACMIP 7226, Beartrap Creek area, Ventura County, southern California, (119°16′30″W, 34°40′48″N).

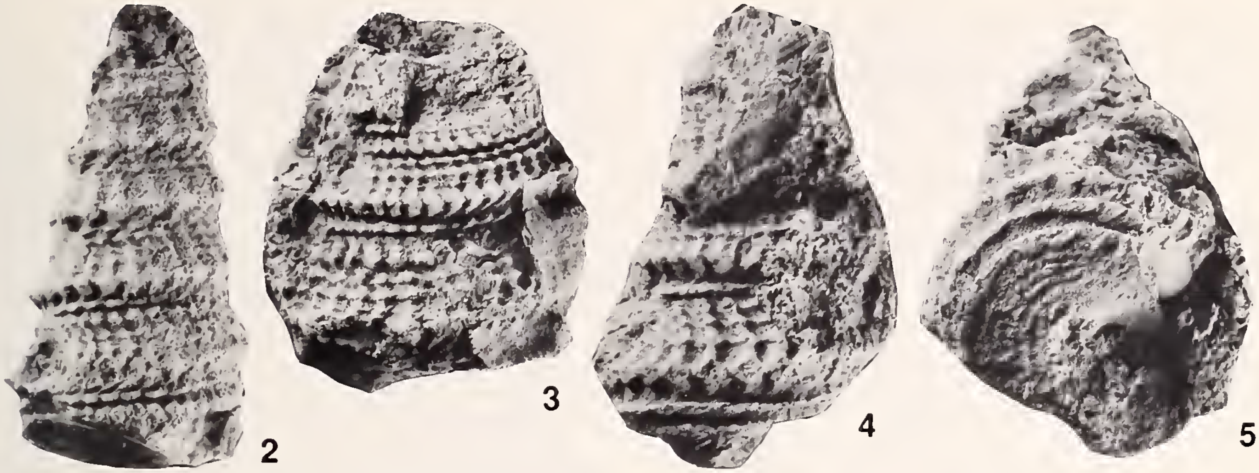
Paratypes: LACMIP 11301 and 11302.

Dimensions: Of holotype (incomplete), height 20 mm, width 11 mm; of paratype 11301 (incomplete), height 13.8 mm, width 10 mm; of paratype 11302 (incomplete), height 13 mm, width 8.5 mm.

Discussion: The new species was compared with all six previously known species of *Potamidopsis*. All are from France, with most occurrences in the Paris Basin. One is the rare *P.* (*P.*) *pourcyensis* Cossmann (COSSMANN, 1913: 170, pl. 2, fig. 151-36; COSSMANN & PISSARRO, 1910–1913: pl. 65, fig. 151-36) from uppermost Paleocene deposits, and the other five are from middle Eocene deposits (Lutetian and/or Bartonian Stages) (GLIBERT, 1962:161–162). They are *P.* (*P.*) *tricarinatus* (LAMARCK, 1804:272; DESHAYES, 1833:pl. 51, figs. 1–9), *P.* (*P.*) *mixtus* (DESHAYES, 1833:pl. 45, figs. 6–11; COSSMANN & PISSARRO, 1910–1913:pl. 28, figs. 151-12 and 151-12′), *P.* (*P.*) *depontaillieri* (COSSMANN, 1881:168, pl. 7, fig. 4; COSSMANN, 1889:69–70, pl. 2, figs. 11–12; COSSMANN & PISSARRO, 1910–1913: pl. 28, fig. 151-13), the rare *P.* (*P.*) *andrei* (VASSEUR, 1881: pl. 6, figs. 9, 15–16; COSSMANN, 1897:pl. 10, figs. 11, 17; 1898:9–10), and the rare *P.* (*P.*) *ripaudi* (VASSEUR, 1881: pl. 5, figs. 9–20; pl. 19, figs. 10–11; COSSMANN, 1898:10–11, pl. 2, figs. 2, 5).

The new species differs from all of these species of *Potamidopsis*, except *Potamides* (*P.*) *andrei* and *P.* (*P.*) *ripaudi*, by possessing reticulate sculpture. The new species most closely resembles *P.* (*P.*) *andrei*. On the basis of comparisons with two LACMIP specimens of *P.* (*P.*) *andrei* from Bois Gouet, France, the new species differs in having (1) a much larger shell that is heavier and thicker, (2) reticulate sculpture that is more strongly developed, (3) less numerous and less closely spaced axial ribs, (4) a sutural rib immediately posterior to the suture, and (5) a much more swollen anterior carina.

On the basis of comparisons with five LACMIP specimens of *Potamides* (*P.*) *ripaudi* from Bois Gouet, France,



Explanation of Figures 2 to 5

Figures 2–5. *Potamides* (*Potamidopsis*) ***californica*** Squires, sp. nov., locality LACMIP 7266. Figure 2: holotype, LACMIP 11300, lateral view, ×3.1. Figure 3: paratype, LACMIP 11301, lateral view, ×3.6. Figures 4 and 5: paratype, LACMIP 11302, ×4.8. Figure 4: lateral view. Figure 5: oblique lateral view showing base of body whorl.

the new species differs in having (1) a larger shell that is heavier and thicker, (2) three rather than two spiral ribs, (3) a much more swollen anterior carina, (4) no tendency for the anterior carina to be absent on the upper spire, (5) weaker axial ribs, (6) axial ribs opisthocline, (7) and no very fine spiral riblets in interspaces.

The new species somewhat resembles *Potamides* (*P.*) *tricarinatus*. The new species was compared with 10 LACMIP specimens of *P.* (*P.*) *tricarinatus* from Fere-en-Tardenois, France. These specimens have the range in morphology shown in the illustrations (Cossmann & Pissaro, 1910–1913:pl. 28, figs. 151-11, 151-11′, 151-11″, 151-11‴, 151-11⁗) of the several varieties of this species. The new species differs from *P.* (*P.*) *tricarinatus* in the following features: (1) three rather than none to two spiral ribs, (2) equal-strength spiral ribs, (3) the presence of axial ribbing, (4) the presence of reticulate sculpture where the axial ribs intersect the spiral ribs, and (5) an anterior carina that is generally not as strong. One particular specimen of *P.* (*P.*) *tricarinatus* illustrated in Cossmann & Pissarro (1910–1913:pl. 28, fig. 151-11) approaches the reticulate sculpture of the new species, but the new species has three rather than two spiral ribs posterior to the carina and has stronger nodes on the carina.

Although four species of Eocene *Potamides* have been reported previously from the Pacific coast of North America, only one actually belongs to *Potamides*. It is *Potamides* (*Potamides?*) *carbonicola* Cooper (Cooper, 1894:44, pl. 1, figs. 14–29) known from lower Eocene to upper Eocene strata in California (Vokes, 1939; Givens, 1974; Givens & Kennedy, 1976) and from middle Eocene strata in western Oregon and western Washington (Turner, 1938; Weaver, 1943). The new species was compared with the descriptions and illustrations of *Potamides* (*Potamides?*) *carbonicola*. The illustrations and emended description in Givens & Kennedy (1976:963–964, pl. 1, figs. 9–13) are particularly useful. The new species also was compared with many specimens of *P.* (*P.?*) *carbonicola* from three widely separated locations on the Pacific coast of North America. Some of these specimens are in collections of the LACMIP and SDSNH, and some are in my private collection. The locations are the Lookingglass Formation, Glide, southwestern Oregon; the Domengine Formation, Griswold Canyon, Vallecitos syncline area, central California; and the Del Mar Formation?, Vista, San Diego County, southern California.

The new species differs from *Potamides* (*P.?*) *carbonicola* in the following features: (1) the upper spire whorls concave rather than flat-sided, (2) reticulate sculpture persisting beyond only the uppermost spire whorls, (3) the anterior carina representing the strongest sculpture everywhere on teleoconch, (4) no tabulate carina in the posterior region of mature whorls, (5) no tendency for the posteriormost spiral rib to equal the carina in strength, (6) no varices on the upper spire, and (7) nodosity does not become obsolete.

The three other Eocene "*Potamides*" species from the Pacific coast of North America are all from the Cowlitz Formation of southwestern Washington, and they belong to genera other than *Potamides*. Givens & Kennedy (1976) assigned *Potamides fettkei* Weaver, 1912, to *Melanoides* (family Thiaridae) and assigned *Potamides lewisiana* Weaver, 1912, to *Elimia* (Family Pleuroceridae). *Potamides packardi* (Dickerson, 1915) is very closely related to "*Potamides*" *lewisiana* and is herein regarded as also assignable to *Elimia*.

Occurrence: Middle Eocene Matilija Sandstone, Ventura County, southern California: at Beartrap Creek area (locality LACMIP 7226) and at Matilija Hot Springs area (localities CSUN 1444, CSUN 1450, LACMIP 24258, LACMIP 24259).

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LOCALITIES CITED

Unless otherwise specified, localities are in the NE¼ of the SE¼ of section 29, T5N, R23W, Matilija quadrangle (7.5 minute), 1952 (photorevised, 1967), in the vicinity of Matilija Hot Springs, Ventura County, southern California.

CSUN 1444. Roadcut on N side of a short, paved road that leads from Highway 33 to Matilija Hot Springs, about 35 m W of sharp bend in this road, near bottom of brackish-marine deposits, in a nonresistant interval.

CSUN 1450. About 120 m SW of junction of Highway 33 and short, paved road that leads to Matilija Hot Springs, on S bank of North Fork of Matilija Creek, near bottom of brackish-marine deposits, in a fairly nonresistant interval.

LACMIP 24258. Approximately at sharp bend in short, paved road that leads from Highway 33 to Matilija Hot Springs, near top of brackish-marine deposits, in a resistant interval 16 m stratigraphically above locality LACMIP 24259. Locality is the same as UCLA 4258 of Jestes (1963).

LACMIP 24259. About 16 m W of sharp bend in short, paved road that leads from Highway 33 to Matilija Hot Springs, near middle of brackish-marine deposits, in a resistant interval 19 m stratigraphically above locality CSUN 1444. Locality is the same as UCLA 4259 of Jestes (1963).

LACMIP 7226. Just E of hill 4560 along an unmaintained trail and downslope for about 15 m from trail, at section line between sections 24 and 25, T7N, R23W, Reyes Peak quadrangle (7.5 minute), 1943, in the vicinity of Beartrap Creek, about 5.6 km N5°E of Reyes Peak, Ventura County, southern California. Source beds not found but probably from near top of hill 4560. Locality is the same as UCLA 4254 of Jestes (1963).

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